UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|---|---|---|---|---|
| 09/772,359 | 01/30/2001 | Eric C. Beck | 3-16 | 1494 |

22046 7590 01/26/2006

LUCENT TECHNOLOGIES INC.
DOCKET ADMINISTRATOR
101 CRAWFORDS CORNER ROAD - ROOM 3J-219
HOLMDEL, NJ 07733

| EXAMINER | |
|---|---|
| MURPHY, RHONDA L | |
| **ART UNIT** | **PAPER NUMBER** |
| 2667 | |

DATE MAILED: 01/26/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) |
|---|---|---|
| | 09/772,359 | BECK ET AL. |
| | Examiner | Art Unit |
| | Rhonda Murphy | 2667 |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *02 November 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-38* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-38* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 March 2005* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Amendment*

1. This communication is responsive to the amendment filed on November 2, 2005. Accordingly, claims 1-38 are currently pending in this application.

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 1-10,15,24,25,33,37 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki (US 6,483,866), in view of Blanz (US 6,907,270).

**Regarding claims 1,5,10,15,24 and 33**, Suzuki teaches a system for use in performing channel sounding, comprising: a transmitter (Fig. 2, element **BS1**), said transmitter including a source of an orthogonal sequence which is repeatedly supplied as an output (Fig. 2, elements **RG1** and **FR1** combined; col. 4, lines 32-36), said orthogonal sequence having been developed as a function of first and second existing orthogonal sequences (Fig. 2, elements **T1** and **T2**; col. 3, lines 45-53; col. 4, lines 22-32); a modulator for modulating a carrier signal by said orthogonal sequence (col. 4, lines 59-63; modulator located within element **TR1** of Fig. 2), said modulator being coupled to said source (Fig. 2, source is depicted as elements **RG1** and **FR1** combined, and is coupled to **TR1** – which comprises a modulator); whereby no channel filtering is

required between said source and said modulator to reduce out-of-band emissions caused by said source (Fig. 2, col. 4, lines 59-63, no filtering occurs between the source and modulator); and a receiver (all elements of Fig. 5) including a demodulator (located within element **19R** of Fig. 5), for demodulating a received modulated version of said orthogonal sequence that modulates a carrier (col. 5, lines 5-10) and which is repeated at least once (it is known in the art that an orthogonal sequence is repeated) was transmitted by said transmitter (col. 4, lines 59-63); a finite impulse response (FIR) filter implementing a least squares algorithm for developing an estimate of the channel characteristic (Fig. 5, element **20**, also shown in detail in Fig. 6A, col. 5, lines 64-67, col. 6, lines 1-27) , said FIR filter being coupled to receive said demodulated orthogonal sequence from said demodulator (Fig. 5, element **19R** contains demodulator coupled to FIR filter - element **20**); whereby no channel filtering is performed between said demodulator and said FIR filter to reduce out-of-band noise inherently resulting from said orthogonal sequence prior to its being supplied to said modulator (Fig. 5, no filtering is performed between the demodulator and FIR filter).

Suzuki fails to explicitly disclose a perfectly white spectrum should the orthogonal sequence be repeated an infinite number of times.

However, Blanz teaches a white spectrum upon repeating the orthogonal sequences (col. 8, lines 58-67; col. 9, lines 1-13).

In view of this, it would have been obvious to one skilled in the art to modify Suzuki's system by including orthogonal sequences that would produce a white spectrum, in order to retrieve the desired signal at the receiving end.

**Regarding claims 2 and 3**, Suzuki further teaches a source of an orthogonal sequence being a memory, which stores said orthogonal sequence (col. 4, lines 27-32, **held in register RG1**) and a sequence generator (col. 4, lines 24-32).

**Regarding claim 4**, Suzuki further teaches an antenna coupled to the modulator for broadcasting said modulated signal (Fig. 2, antenna **ANT-T1** is coupled to modulator located within element **TR1**).

**Regarding claims 6,25,37 and 38**, Suzuki teaches a transmitter and method for use in performing channel sounding, comprising the steps of: repeatedly supplying a plurality of orthogonal sequences that is a function of first and second existing orthogonal sequences and has a perfectly white spectrum should said orthogonal sequence be repeated an infinite number of times (col. 3, lines 45-53; col. 4, lines 22-32); modulating each of a plurality of identical carrier signals by a respective one of said plurality orthogonal sequences (col. 4, lines 59-63), said means for modulating being coupled to said means for repeatedly supplying (Fig. 2, modulator coupled to source); whereby no channel filtering to reduce out-of-band emissions is performed on any of said plurality of orthogonal sequences between said source and said modulator (Fig. 2); and recording and playing back said modulated carrier signal (it is known in the art that a modulated carrier signal may be recorded and played back).

Suzuki fails to explicitly disclose a perfectly white spectrum should the orthogonal sequence be repeated an infinite number of times.

However, Blanz teaches a white spectrum upon repeating the orthogonal sequences (col. 8, lines 58-67; col. 9, lines 1-13).

In view of this, it would have been obvious to one skilled in the art to modify Suzuki's system by including orthogonal sequences that would produce a white spectrum, in order to retrieve the desired signal at the receiving end.

**Regarding claims 7 and 8**, Suzuki further teaches a means for repeatedly supplying as a memory, which stores said orthogonal sequence (col. 4, lines 27-32, **held in register RG1**) and as a sequence generator (col. 4, lines 24-32).

**Regarding claim 9**, Suzuki further teaches means for broadcasting said modulated signal (Fig. 2, antenna **ANT-T1**).

### *Claim Rejections - 35 USC § 103*

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki in view of Kroeger (US 2003/0137928).

**Regarding claim 11**, Suzuki teaches an orthogonal sequence in an FIR filter (col. 5, lines 64-67, col. 6, lines 1-27).

Suzuki fails to teach FIR filter coefficients as complex conjugate values.

However, Kroeger teaches complex conjugate values (paragraph 55).

In view of this, having the system of Suzuki and then given the teaching of Kroeger, it would have been obvious to one having ordinary skill in the art at the time

the invention was made to modify the system of Suzuki, by utilizing complex conjugate values so as to smooth the resulting symbols over time (paragraph 55).

3. Claims 12 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki, in view of Bar-David et al (US 5,623,511).

**Regarding claims 12 and 17**, Suzuki teaches a plurality of channel estimates produced by said FIR filter (col. 6, lines 6-10).

Suzuki fails to teach an averager for averaging the channel estimates.

However, Bar-David teaches an averager for averaging a plurality of channel estimates (col. 15, lines 25-30).

In view of this, having the system of Suzuki and then given the teaching of Bar-David, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Suzuki, by including an averager so as to obtain a more accurate channel estimate.

4. Claims 13 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki, in view of Butler (US 6,771,620).

**Regarding claims 13 and 16**, Suzuki teaches a demodulated training sequence being received by said FIR filter, and there being no band-limiting filter in said transmitter (Fig. 5, element **20**, also shown in detail in Fig. 6A, col. 5, lines 64-67, col. 6, lines 1-27).

Suzuki fails to teach using a band-limiting filter to eliminate out of band noise picked up at said receiver.

Butler teaches using a baseband filter to eliminate out of band noise picked up at said receiver (col. 13, lines 28-36).

In view of this, having the system of Suzuki and then given the teaching of Butler, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Suzuki, by including a band-limiting filter so as to allow a certain range of frequencies to pass, thus providing a smoother signal with minimal noise.

5. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki, in view of Shattil (US 2004/0100897).

**Regarding claim 14**, Suzuki teaches means for receiving a wireless broadcast version of said modulated version of an orthogonal sequence (col. 5, lines 5-8).

Suzuki fails to teach converting it into an electrical representation.

However, Shattil teaches converting the orthogonal sequence into an electrical representation (paragraph 72, page 6).

In view of this, having the system of Suzuki and then given the teaching of Shattil, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Suzuki, by converting the orthogonal sequence into an electrical form, so as to reduce signal fading and interference (paragraph 5, page 1).

6. Claims 18,21,26,29,30,34 and 35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki, in view of Wallace (US 6,473,467) and Blanz (US 6,907,270). **Regarding claims 18, 29 and 34**, Suzuki teaches a system for use in performing channel sounding, comprising: a transmitter and receiver (Fig. 2 element **BS1** and Fig. 5 all elements), said transmitter including a supplier of a plurality of orthogonal sequences each of which is a version of an original orthogonal sequence (Fig. 2, elements **RG1** and **FR1** combined; col. 4, lines 32-36), each of said plurality of orthogonal sequences being repeatedly supplied (co. 4, lines 32-36), said original orthogonal sequence having been developed as a function of first and second existing base orthogonal sequences and having a perfectly white spectrum should said original orthogonal sequence be repeated an infinite number of times (Fig. 2, elements **T1** and **T2**; col. 3, lines 45-53; col. 4, lines 22-32). Suzuki also teaches a modulator for modulating a carrier signal by said orthogonal sequence (col. 4, lines 59-63; modulator located within element **TR1** of Fig. 2), said modulator being coupled to said source (Fig. 2, source is depicted as elements **RG1** and **FR1** combined, and is coupled to **TR1** – which comprises a modulator); a demodulator (located within element **19R** of Fig. 5), for demodulating a received modulated version of said original orthogonal sequence that modulates a carrier (col. 5, lines 5-10); a finite impulse response (FIR) filter implementing a least squares algorithm to produce a plurality of channel estimates, one for original orthogonal sequence (Fig. 5, element **20**, also shown in detail in Fig. 6A, col. 5, lines 64-67, col. 6, lines 1-27), said FIR filter being coupled to receive said demodulated orthogonal sequence from said demodulator (Fig. 5, element **19R** contains

demodulator coupled to FIR filter - element **20**); without any channel filtering to reduce out-of-band emissions inherently resulting from said versions of said original orthogonal sequence that modulated said carrier to ultimately become said received versions after passing through a channel and being received being performed between said demodulator and said respective associated FIR filter. (Fig. 5, no filtering is performed between the demodulator and FIR filter).

Suzuki fails to teach a plurality of modulators, demodulators and FIR filters.

However, Wallace teaches a plurality of modulators (Fig. 1A, elements **116A – 116T**) for producing a plurality of modulated signals by modulating a carrier signal by said each of said plurality of orthogonal sequences (Fig. 1A, col. 3, lines 55-67), and a plurality of demodulators (Fig. 1A, elements **124A – 124R**), each of said demodulators demodulating a respective plurality of received versions of said original orthogonal sequence that each modulates said carrier (col. 4, lines 10-13; orthogonal sequence represented by OFDM – orthogonal frequency division multiplexing, col. 2, lines 50-51);

It is known in the art that a plurality of FIR filters are used for each received version of the orthogonal sequence and coupled to receive its respective plurality of demodulated orthogonal sequences from a respective one of said demodulators.

In view of this, having the system of Suzuki and then given the teaching of Wallace, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Suzuki, by incorporating a plurality of modulators, demodulators and FIR filters, in order to accommodate the growing

demand for wireless communication, increase spectral efficiency, improve performance and enhance flexibility (col. 3, lines 38-40).

Suzuki also fails to explicitly disclose a perfectly white spectrum should the orthogonal sequence be repeated an infinite number of times.

However, Blanz teaches a white spectrum upon repeating the orthogonal sequences (col. 8, lines 58-67; col. 9, lines 1-13).

In view of this, it would have been obvious to one skilled in the art to modify Suzuki's system by including orthogonal sequences that would produce a white spectrum, in order to retrieve the desired signal at the receiving end.

**Regarding claims 21,26,30 and 35**, Suzuki teaches a plurality means for broadcasting said modulated signal (Fig. 2) and an output by FIR filter (Fig. 5, output from element **20**).

Suzuki fails to teach a plurality of means for broadcasting being coupled to a respective one of said means for modulating and a demultiplexer for separating out each channel estimate supplied as an output by the one of said FIR filters to which said demultiplexer is coupled.

However, Wallace teaches a plurality of means for broadcasting being coupled to a respective one of said means for modulating. (Fig. 1A) and a demultiplexer for separating out each channel estimate supplied as an output (col. 9, lines 32-33).

In view of this, having the system of Suzuki and then given the teaching of Wallace, it would have been obvious to one having ordinary skill in the art at the time

the invention was made to modify the system of Suzuki, by including a demultiplexer and a plurality of broadcasting means connected to modulators, in order to accommodate the growing demand for wireless communication, increase spectral efficiency, improve performance and enhance flexibility (col. 3, lines 38-40). Additionally, it would have been obvious to include a plurality of demultiplexers for separating out each channel estimate supplied as an output by one of the FIR filters.

7. Claims 19,20,22,23,27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki, Wallace and Blanz as applied to claims 18,29 and 34 above, and further in view of Lomp (US 6,272,168).

**Regarding claims 19,20,22,23,27 and 28**, Suzuki and Wallace teach a supplier of a plurality of orthogonal sequences comprising a source of said original orthogonal sequence (col. 4, lines 32-36).

Suzuki and Wallace fail to teach at least two delayed versions of said original orthogonal sequence; wherein the delay between each orthogonal sequence of said plurality of orthogonal sequences is substantially equal.

However, Lomp teaches at least two delayed versions (col. 10, lines 11-14, 35-43) of the sequence, wherein the delay between the plurality of sequences is substantially equal and not substantially equal (it is known in the art that delays between sequences are capable of variable lengths). It is also known in the art that said plurality of orthogonal sequences include at least said original orthogonal sequence and at least one delayed version of said original orthogonal sequence.

In view of this, having the system of Suzuki and Wallace and then given the teaching of Lomp, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Suzuki and Wallace, by incorporating delays between the sequences, in order to improve overall timing issues related to the plurality of sequences (col. 10, lines 40-42).

8. Claims 31 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki, Wallace and Blanz as applied to claims 29 and 34 above, and further in view of Butler (US 6,771,620).

**Regarding claims 31 and 36**, Suzuki and Wallace teach a plurality of demodulators and FIR filters for reducing out-of-band noise that was introduced into said baseband demodulated received orthogonal sequence through said channel or at said receiver.

Suzuki and Wallace fail to teach a bandlimiting filter.

However, Butler teaches a baseband filter coupled between at least one demodulator and FIR filters (Fig. 5, col. 13, lines 28-36).

In view of this, having the system of Suzuki and Wallace and then given the teaching of Butler, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Suzuki and Wallace, by including a band-limiting filter so as to allow a certain range of frequencies to pass, thus providing a smoother signal with minimal noise.

9. Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki, Wallace and Blanz as applied to claim 29 above, and further in view of Bar-David et al (US 5,623,511).

**Regarding claim 32**, Suzuki and Wallace teach a plurality of channel estimates produced by said FIR filter.

Suzuki and Wallace fail to teach an averager for averaging the channel estimates.

However, Bar-David teaches an averager for averaging a plurality of channel estimates (col. 15, lines 25-30).

In view of this, having the system of Suzuki and Wallace and then given the teaching of Bar-David, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the system of Suzuki and Wallace, by including an averager so as to obtain a more accurate channel estimate.

### *Response to Arguments*

10. Applicant's arguments filed November 2, 2005 have been fully considered but they are not persuasive. Applicant argues that the combined references, Suzuki and Blanz, fail to teach an orthogonal sequence developed as a function of first and second existing orthogonal sequences having a perfectly white spectrum; and no channel filtering performed between the demodulator and the FIR filtering implementing a least squares algorithm. However, Examiner respectfully disagrees. Examiner understands that Blanz's white spectrum is coming from a white noise source and it is known in the

art that white noise exists. The spectrum described in the Blanz reference is a white spectrum and it would be obvious to supply the white noise at the transmitter. The white noise spectrum provided at the transmitter would have the same effect if the white noise were provided in the channel. In regard to "no channel filtering performed between the demodulator and the FIR filtering implementing a least squares algorithm", Applicant is directed to the citation listed above in the rejected independent claims in which Figure 5 illustrates no channel filtering between the demodulator and the FIR filter. Furthermore, the implementation of a least squares algorithm is known in the art and stated in applicant's admitted prior art. Therefore, the cited references teach the claimed limitations and the rejection is maintained.

***Conclusion***

11. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rhonda Murphy whose telephone number is (571) 272-3185. The examiner can normally be reached on Monday - Friday 8:00 - 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Chi Pham can be reached on (571) 272-3179. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Rhonda Murphy
Examiner
Art Unit 2667

RLM

CHI PHAM
SUPERVISORY PATENT EXAMINER

1/20/06